MC0346

Capital Investment Manual

IM&T Guidance

Information
Management
Group

NHS
Executive

This booklet is part of the *Capital Investment Manual*. It contains guidance specific to investments in information management and technology. It takes the planning process on from approval of the Outline Business Case through to implementation of the system. It must be read in conjunction with the *Business Case Guide*.

The *Capital Investment Manual* comprises the following booklets:

Overview

Project Organisation

Private Finance Guide

Business Case Guide

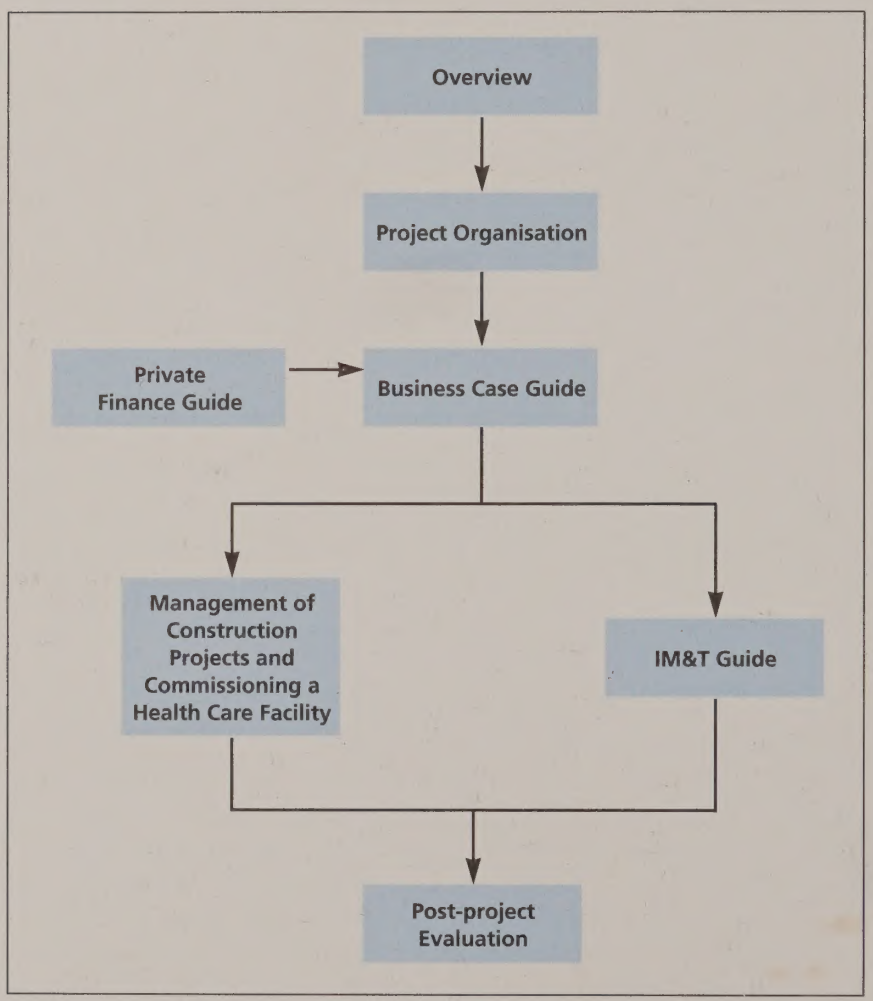
Management of Construction Projects

Commissioning a Health Care Facility

IM&T Guidance

Post-project Evaluation

Copies are available at all HMSO Bookshops.



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Introduction

This booklet provides guidance on information management and technology (IM&T) investments. IM&T here covers the use and management of information through organised systems of all forms, whether based on human endeavours, paper methods or information technology. IM&T also includes the communication of voice and images.

How to Use this Guide

This Guide is intended to ensure the successful planning, specification, procurement and implementation of IM&T systems which support clinical and business objectives and provide value for money.

Detailed guidance on investment appraisal techniques, and specifically on the production of the Outline Business Case, is given in the *Business Case Guide*. The *IM&T Guide* is relevant to cases where the approved preferred option identified in the Outline Business Case is an IM&T-based solution. It provides IM&T-specific guidance on the production of the Full Business Case, the procurement of the system, its implementation and, finally, the benefits realisation programme required to ensure that anticipated benefits are achieved. Following this introduction there are two further sections:

- Full Business Case, including benefits realisation; and
- Implementing the preferred option.

Approval

All projects which have a lifetime cost in excess of the Trust's delegated limit are required to secure NHS Executive and HM Treasury approval for that investment at various stages throughout the project's development. These approval states are as follows:

- Regional Office approval of the Outline Business case
- NHS Executive/HM Treasury approval of the Full Business Case
- NHS Executive check pre-award of contract.

Figure 1 sets out the approval route with regard to IM&T investments.

Procurement

The procurement of an IM&T system is undertaken concurrently with the production of the business case. The methodology recommended for the procurement of an IM&T system in the NHS is POISE (Procurement Of Information Systems Effectively). Details of the full POISE process are available from:

The NHS Supplies Authority
Apex Plaza
Forbury Road
Reading RG1 1AX
Tel: (0734) 595085

A summary chart of the POISE process is given in Appendix 1.

For IM&T projects the approval stages noted above apply at the following Steps in POISE:

- Step 6 of POISE, the production of the Detailed Statement of Need (DSON) is incorporated within the Outline Business Case. Regional Office approval of the funding must be secured at this stage. Work on POISE Steps 7 (Summary of Need [SON]) to 9 can of course continue in parallel with securing this approval, but cannot prejudice the approval decision.

- Following the approval of the Outline Business Case, the detailed work on the Full Business Case can commence. NHS Executive/HM Treasury approval should be secured at POISE Step 13A, before the contract schedules are issued.

- An award check must be made after the ITT responses have been received and before the contract is awarded at Step 16.

Figure 2 sets out the relationship between the POISE, investment appraisal and approval processes.

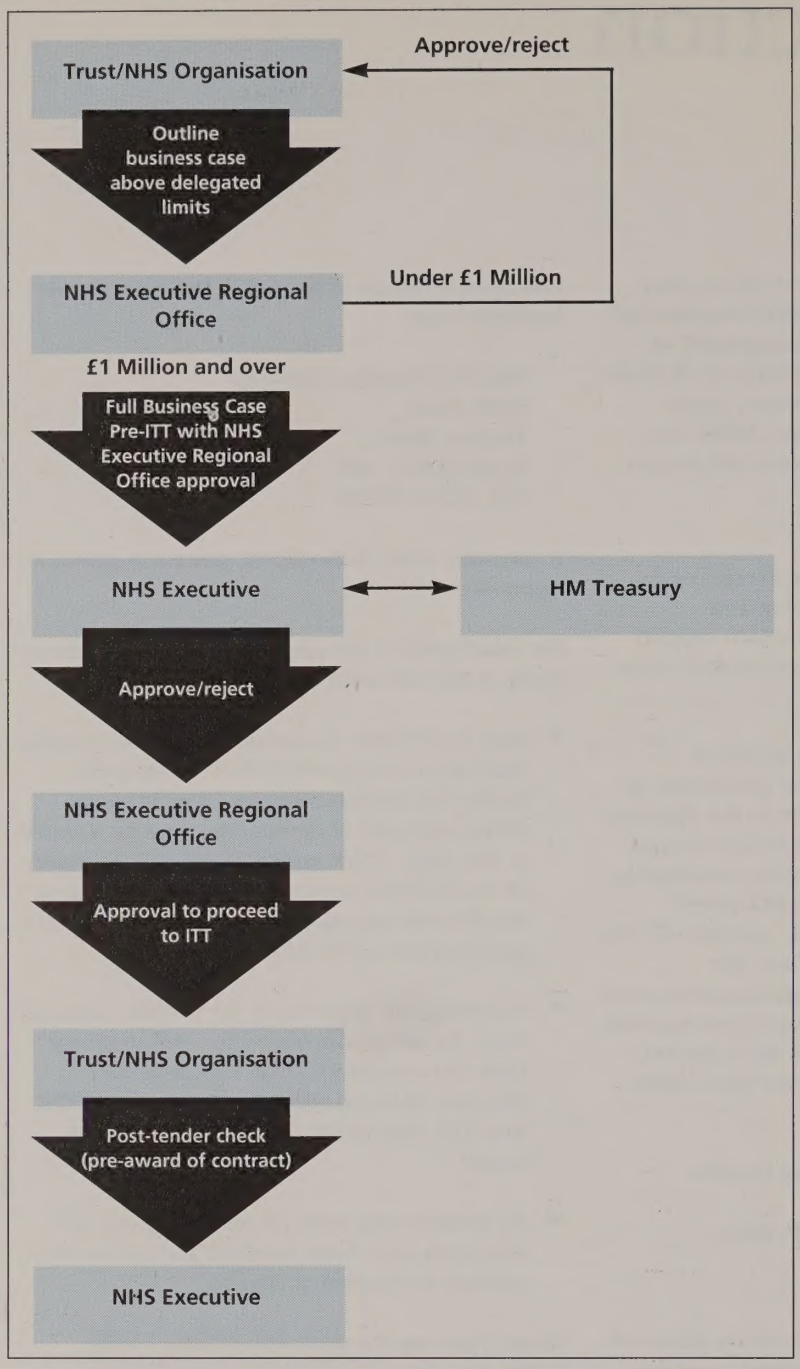
The application of national procurement standards, set out in STEP (STandards Enforcement in Procurement) will ensure that the quality of IM&T systems purchased by the NHS is improved. An introduction to STEP is given in Appendix 2.

Scope of work

The scope of the work required to complete a Full Business Case will vary from case to case. By considering the points set out in this guide, Trusts will be able to assess more precisely the resources necessary to complete their particular project.

In addition, Trusts must agree with their NHS Executive Regional Offices the level of detail required before embarking on the production of a Full Business Case. NHS Supplies Authority provide a service to facilitate procurement, and the Information Management Group of the NHS

FIGURE 1 THE APPROVAL ROUTE



Executive can provide assistance and guidance on project implementation and benefits realisation.

Audience

The IM&T guide is designed to be used by business planners, project managers, senior managers, and IM&T professionals involved in the production of the Full Business Case, procurement, implementation, benefits realisation and subsequent review of the project.

Project Management

Chief Executives are ultimately responsible for the management of capital investment schemes throughout the investment process, from inception to post-project evaluation. Responsibility for ensuring that the project is co-ordinated, well managed and that objectives of the project are met may be delegated to a project manager.

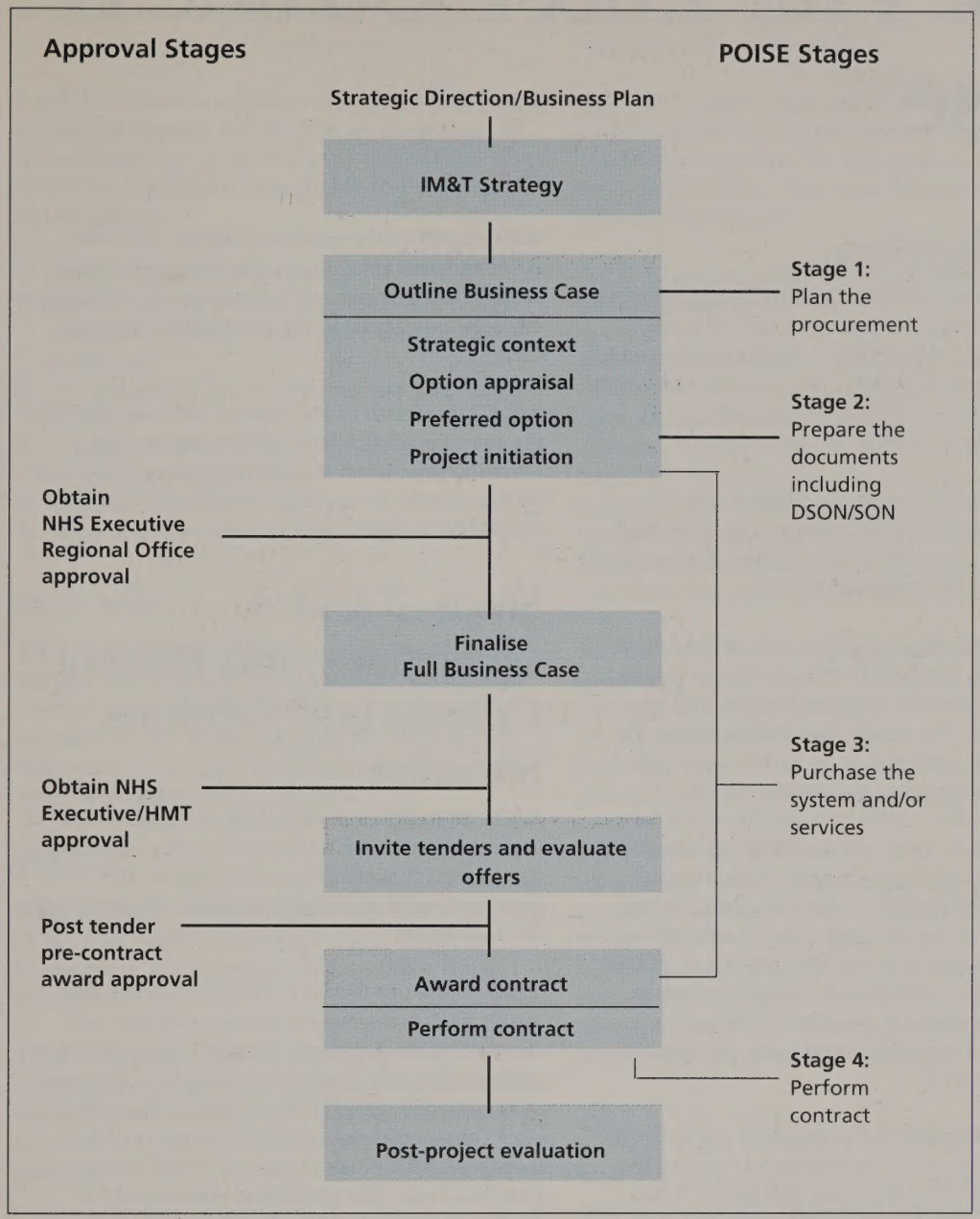
The use of the PRINCE (PRojects In a Controlled Environment) methodology for the management and control of IM&T projects in the NHS is mandatory. General guidance and a summary of the PRINCE methodology are given in the *Project Organisation* booklet.

Other Material

This guide should be read in conjunction with other CIM booklets. Other relevant NHS documentation includes:

- *PRojects IN a Controlled Environment (PRINCE)*
- *Strategic Planning in the NHS*
- *Standards Enforcement Procedures (STEP)*
- *National IM&T Strategy*
- *Procurement Of Information Systems Effectively (POISE)*

FIGURE 2 RELATIONSHIP BETWEEN POISE AND CAPITAL INVESTMENT



The Full IM&T Business Case

Introduction

1.1.1 The principles that govern the preparation of the Outline Business Case are outlined in the *Business Case Guide*. This is conducted in parallel with steps 6–15 of POISE. The Detailed Statement of Need (DSON) will have been produced in tandem with the Outline Business Case.

1.1.2 The Full Business Case differs from the Outline Business Case in the level of detail and robustness of the information within it, particularly in relation to the preferred option.

1.1.3 The Full Business Case will include more accurate cost and benefit information, and will develop the way the preferred option will be implemented. The initial step in developing the Full Business Case will be to review the work previously undertaken to ensure that the assumptions made in the Outline Business Case remain valid. Section 9 of the *Business Case Guide* lists the key factors for consideration. However, additional IM&T-related issues are listed below. Appendix 5 of the *Business Case Guide* outlines the key requirements of a Full Business Case. POISE also highlights evaluation and implementation issues which must be considered within the production of a Full Business Case, prior to the award of contract.

1.1.4 Evidence that the investment can and will succeed will need to be provided as part of the Full Business Case, including readiness of the organisation, training and implementation and benefits identification and realisation.

1.1.5 The system should conform to national standards and requirements, such as:

- Contract Minimum Data Sets;
- coding standards;
- security and health and safety standards; and
- the new NHS Number.

Compliance with these standards will have cost implications which should be included in the Full Business Case. Further information on these and other national standards is given in STEP (see Appendix 2).

Step 1: The Strategic Context

1.2.1 Any other local or national IM&T developments and initiatives should be re-assessed with respect to the preferred option. Any new developments since the Outline Business Case should also be addressed, detailing the impact on expectations expressed in the Outline Business Case.

1.2.2 Full details of the funding arrangements for the investment, financial consequences (e.g. revenue, price), etc. should be detailed. This may reflect options for leasing (see *Private Finance Guide*) or facilities management.

Steps 2 and 3: Objectives and Benefit Criteria and Options Shortlist

1.3.1 Although major changes to the objectives of the investment and the benefit criteria identified in the Outline Business Case are unlikely, the resources required to achieve them will need to be re-considered.

1.3.2 These are linked to POISE steps 6-8 and 12-13, 'Define evaluation criteria, evaluate and shortlist viable suppliers'. The Full Business Case requires that any contract awarded be robust and in accordance with POISE guidance. The criteria used for shortlisting suppliers will need to be consistent with those expressed in the Outline Business Case. The evaluation criteria used in POISE, in turn, provide a key link to the business case in ensuring the right supplier is selected, managing risk by testing the credibility of the suppliers, and providing the basis for fair and defensible award of contract, based on value for money. (POISE step 16.)

Step 4: Benefits Assessment

Detailed Benefits Quantification and Valuation Schedules

1.4.1 There may not have been sufficient detail available for the Outline Business Case to include benefits other than as high-level targets, or typical estimates from other procurements and projects. More detailed work on the expected benefits will therefore be required.

1.4.2 The extent to which any benefit is expected to be qualitative, quantitative and/or cash releasing

will need to be assessed for each system under consideration. The *Business Case Guide* outlined the process of objectives analysis, a top-down technique, for benefits identification.

1.4.3 In order to establish a baseline, a first step in identifying benefits will involve an assessment of how activities are currently being carried out. Some of the key features to note about activities include the answers to:

- **What** is done? Is it necessary?
- **How** is it done? Could it be done differently? Can it be combined with other activities or separated?
- By **whom** is it done? Are they the best people to do it?
- **When** is it done? Could it be done later ? Could it be done straight away?
- **Where** is it done?
- **Why** is it done?

Disbenefits

1.5.1 Although not always explicitly highlighted, analysis may also identify disbenefits. Disbenefits occur when an additional resource is required to complete a task or the outcome is impaired. This may occur to enable a benefit to be achieved in some other more significant area.

Phasing

1.6.1 Particular attention must be given to phasing of benefits, since normally for major IM&T investments, the realisation of benefits is not immediate.

1.6.2 There will often be an optimal implementation approach for achieving benefits, of which suppliers should be made aware. It may need to be included in the DSON/SON, and contract.

Credibility

1.7.1 The benefits assessment must be credible and reflect what can be attained. Benefits realisation plans, agreed by the users and managers must provide evidence of robust benefits management.

New Information

1.8.1 Any new benefit criteria should be incorporated.

1.8.2 Increased knowledge about the investment options, or further work within the organisation, will often result in the indentification of other benefits. These should be incorporated.

Step 5: Cost Assessment

1.9.1 Proposals received from suppliers will have indicative costs included. These can be used to form the basis for tendered costs in the Full Business Case. If at the tender stage these costs vary by more than an amount agreed with the approving authority (10 per cent in the case of the NHS Executive and HM Treasury) the business case will have to be resubmitted.

1.9.2 The contract framework (POISE Step 9) will have identified the responsibilities of the organisation in respect of the contract. This will help clarify some of the attributable costs which must all be included.

1.9.3 There are further less tangible costs which should be addressed.

1.9.4 The time when a system (or module) is first implemented can be very demanding on staff, some of whom will be using computers operationally for the first time. Many sites have found, for example, that queues of patients can develop while staff are coming to grips with the system. Adequate (additional) cover and availability of help are paramount. Trainers and support staff may work alongside regular staff in such situations.

1.9.5 Resourcing requirements will also vary depending on the level of access and support required: is 24-hour availability necessary? What are the implications of the system not being available? Appropriate measures for support, disaster recovery and maintenance are required.

1.9.6 The costs and benefits of any option that uses private finance (e.g. leasing) should be compared with an equivalent option financed conventionally, i.e. purchase. Similarly, facilities management options should be compared in the normal way using NPV analysis and equivalent annual values if necessary. Step 5 of the *Business Case Guide* describes these techniques.

Step 6: Risk Assessment

1.10.1 In developing the Full Business Case, the risks in the Outline Business Case need to be reconsidered in detail, including how risks are to be reduced or managed. This has been addressed in detail in Section 6 of the *Business Case Guide.* Some specific examples of risk associated with IM&T investments are highlighted below.

1.10.2 System development projects are particularly prone to risk of delay and cost overrun. Firm project and development plans may be required as evidence of realistic targets and containment procedures.

1.10.3 Large information systems projects are also prone to risk by virtue of their complexity. This is particularly true of implementations which require a degree of integration, either within the organisation or externally. The risks may be technical or organisational:

- Can the expected/required performance be met?
- Has the demand/volume of transactions been correctly sized? Is there capacity to deal with unexpected peaks?

- Is the organisation sufficiently prepared, trained and resourced to implement and operate the investment?
- Will the organisation accept it?
- Is there a 'Plan B'? If for any reason the chosen investment becomes unviable, what are the consequences?

1.10.4 Supplier failure, though not often catastrophic, can manifest itself in non-delivery of products. Even robust contracts are not likely to compensate fully for loss of required functionality or products.

1.10.5 External risks also need to be considered: change in staffing costs, changes in the NHS, changes in data requirements, coding systems and data standards, changes in purchaser attitudes, etc.

1.10.6 The level of likelihood of the risk, and its impact on each of the options, should be indicated.

1.10.7 These risks should also be taken into account when negotiating contracts with shortlisted suppliers. (POISE Step 14.)

Additional Information required for an IM&T Full Business Case

1.11.1 The criteria used for approving substantial IM&T investments are listed in Appendix 3. The appendix also identifies the documentation, in addition to the Full Business Case, that should be submitted to the approving authority.

Readiness of the Organisation

1.12.1 A review of policies and procedures should be conducted and any important outcomes reported within the business case.

1.12.2 The Full Business Case should also include information about how it is intended to communicate internally and externally: some organisations have prepared communications strategies and plans to this effect. Implementing a major information system will often require significant organisational change. This can only be achieved through a consultative process involving staff at all levels.

1.12.3 The Full Business Case should give an indication of:

- mechanisms for presentation to staff;
- past and planned involvement of users;
- evidence of users' interest and commitment to the success of the project;
- identification of a project sponsor;
- evidence of senior management (Chief Executive) commitment;
- organisational plans, such as management reorganisation or management of change;
- external publicity; and
- publicity and communications for patients and other indirectly involved parties.

Project Management

1.13.1 IM&T projects should be managed using the PRINCE methodology. The structure and organisation of the project should be indicated, and its relationship to the rest of the organisation.

1.13.2 Wherever possible, roles within the project should be assigned to named individuals.

1.13.3 Change control procedures should be defined.

1.13.4 The supplier's role should be stated explicitly. The definition of each shortlisted supplier's and organisation's respective responsibilities for implementation, and the scope and timing of implementation, provides a basis for costing and planning implementation resourcing.

Training and IM&T Skills

1.14.1 The Full Business Case requires a credible assessment of training needs, how these will be met and resourced. Training needs other than those directly related to the technology and its implementation should also be considered, e.g. project management training, analysis skills, etc.

1.14.2 Any recruitment needs should be outlined, with due consideration of costs and timescales.

1.14.3 Existing resources, and the structure and extent of the pool of other available resources, should be made explicit.

1.14.4 If temporary contracted expertise and support will be required, the scope and quantity of this must be made clear. If skills transfer is expected, how this is to be accomplished should be made evident.

1.14.5 The project plans for training may benefit from sanction by the project owner within the organisation. If training cannot be adequately resourced, the success of implementation will be seriously compromised.

1.14.6 Policy decisions will need to be made about access to the systems for untrained people and how to ensure no one can refuse to be trained.

1.14.7 The project team and stage implementation teams need certain new skills. The formation of the team and their training in project management and other specific skills need to be resourced.

Benefits Realisation

1.15.1 The realisation of benefits is one of the most complex aspects of successful implementation of an IM&T system.

1.15.2 Benefits realisation plans define the organisational feasibility of the financial cost-benefit analysis.

1.15.3 Benefits realisation planning encourages commitment to an information system's investment by focusing the efforts of staff on areas which bring tangible benefits. Furthermore, it ensures expectations remain realistic, avoiding future disappointment or unmet demands by budget holders. The plan needs to define the activities that are to take place, the resources required to complete these activities, persons responsible, dependencies, constraints, deliverables and project timescales.

Benefit	something that improves or is favourable; advantage
Realise	convert hopes and plans into fact; convert into money

1.15.4 The following section describes the major components of the benefits realisation planning phase.

1.15.5 Benefits such as saving time on a task or reducing the number of phone calls do not happen automatically. Benefits need to be identified; the actions and resources required to deliver those benefits need to be planned; and then the plans should be carried out. The plans include definition of resources required, activities, timescales, expected deliverables (benefits), identification of responsibility and how to monitor success or failure (i.e. post-implementation review).

1.15.6 Experience from sites suggests that staff savings, in particular, need to be carefully managed. Because time savings happen in small quantities spread across several disciplines, these times must in some manner be accumulated into realisable savings. There is a very real risk of Parkinson's Law applying to any time savings: work will expand to fill the time available! Thus, planning to make use of these time savings is essential.

TABLE 1 BUDGETING FOR INVESTMENT IN TRAINING

- Initial training required: 80% of staff, for equivalent of two days.
- Organisation's staffing budget: £26,000,000
- Organisation's staff complement (individuals, not whole time equivalent): 2,200
- 2 days out of a year (365 days) represents 0.5% of time
  (realistically, a year is 46 week, 5 day/week, and 2 days represents nearly 0.9 %)
- 0.5% of of 80% of £26,000,000 = **£1,040,000** staff time for training
- Additional costs include resourcing training facilities and trainers.
  Project plans typically show training costs at £50,000.
- Benefits: The formalisation of procedures and policies imposed by the discipline of computerisation may release several days of informal staff support time and training for new intake of staff, e.g. junior doctors. This saving could represent as much as 2 days for 10% of staff.

SCOPE OF REALISATION PLANNING

1.16.1 There is a cost associated with the benefits realisation planning and monitoring process. Depending on the nature of the investment and the resources available, it may be more cost effective to consider only certain high-benefit areas in detail. Other areas could be covered by more global targets and measures that can be monitored collectively.

1.16.2 If several systems are to be considered, each of which meets most of the objectives, it may be necessary to consider several realisation plans. The realisation plans will help identify the cost of meeting the objectives for each system, thus providing useful information for final selection. Thus, if it is anticipated that a combination of options will ultimately be chosen, one realisation plan, with options identified where they exist, is the most effective presentation;

RESPONSIBILITY AND AUTHORITY FOR REALISATION OF BENEFITS

1.17.1 The task of achieving benefits, in particular staff savings, by reorganising work and changing skill mix, is difficult and cannot be accomplished without significant management effort.

1.17.2 It will depend on the management style and structure of a given organisation as to how it is done, but responsibility will need to be assigned to individuals to deliver agreed benefits. These may include the budget holder, the clinical director, business manager, and department head. It is not the responsibility of the project manager to realise benefits. Whoever does have responsibility for delivering the benefit should also have the appropriate authority to enable this to be done.

1.17.3 Some of the means to assign responsibility that have been employed at sites include: incorporating accountability in individual performance appraisals and pay reviews; control by disciplinary procedure; motivation by allowing freedom to utilise realised benefits as desired; cutting budgets by the extent that benefits are to be realised as cash releasing; and bonuses for achieving or exceeding targets.

1.17.4 Checklist for the contents of a benefits realisation plan:

- What is the benefit, both type and target (this can be referenced back to the objective that will be met if the benefit is achieved)?
- What disbenefits, are there, and what are their implications for affected staff?
- How is the benefit to be achieved?
- What are the proposed options, and to what extent will each provide the benefit?
- What assumptions have been made for achieving the benefit (e.g. system to be installed before new service started)?

- How long will it be before benefits become available?

- What are the policy issues?

- Who is responsible for ensuring the benefit is achieved?

  – actions to achieve benefit (training in the use of the system; provision of resource);

- Who will monitor how well the benefit is being achieved?

- How will the benefit be monitored – what information and mechanisms will be needed?

  – where known, the system feature which is expected to provide the benefit and the benefit should be linked;

- To what extent is the benefit dependent on staff acceptance of the system and their capacity to change and learn?

- To what extent is the benefit dependent on other modules or systems being in place?

- What benefit arises from the linking and integration that implementation offers?

DELIVERABLES

1.18.1 These should be:

- a series of benefits realisation plans with assumptions, interactions and dependencies identified, and linked to implementation plans;
- assessment of policy issues to be addressed, this should also note any action to be taken;
- realisation plan review procedures agreed and documented; and
- management action and responsibility for realising benefits linked into the plans.

Implementing the Preferred Option

Introduction

2.1.1 The purpose of this section is to highlight the key issues and actions that ensure the successful implementation of an IM&T system. This section is based on good practice, and is designed to inform the implementation of large and complex systems. The principal audience for this section is the project manager.

2.1.2 Implementation requirements will depend on the system to be installed, and on the strength of the existing support network at the site. It will be to the organisation's ultimate benefit to utilise its own staff and resources as far as possible.

2.1.3 The greatest weakness has often been in planning and managing the organisational change and development associated with a major IM&T implementation.

DEFINING IMPLEMENTATION

2.1.4 Traditionally, implementation is a project stage starting after the contract is signed, involving the testing, installation and acceptance of hardware and software, and the provision of training, ending at final acceptance and payment.

2.1.5 For a modern IM&T project, implementation should be considered in a wider context, not just as an IT installation. It will often involve changes in the way people work, typically towards an integrated, seamless approach to patient care, with departmental and local interests becoming secondary to corporate objectives and the interests of the patient.

2.1.6 Implementation issues can be on the critical path as soon as consideration is given to the decision to invest.

2.1.7 Successful implementation requires a firm foundation based on:

- business plans and strategy;
- IM&T strategy;
- human resources strategy;
- project management and planning;
- organisational plans; and
- procurement plans.

Each will influence IM&T implementation, and in turn, implementation may have an impact on each of the plans.

2.1.8 The entire organisation will be involved to a greater or lesser extent in any major IM&T implementation in which the mechanisms for communication and information flows are affected. The impact and interaction of smaller systems implementation, such as departmental systems, will inevitably be wider than the boundary of the department concerned.

2.1.9 Table 2 indicates some of the stakeholders, and possible points of view, of an IM&T implementation.

The Role of Senior Management

2.2.1 Implementing a major information system is inevitably a long, difficult project. It is therefore essential for senior management to make a significant contribution in terms of committment and communication, and in managing change and risk.

COMMITMENT

2.3.1 Commitment needs to be visible and demonstrable. The extent to which people at the

TABLE 2 IDENTIFYING BENEFIT CRITERIA (TOP DOWN)

Potential Stakeholders	Potential Benefits
staff	
porters:	now moving more patients and fewer pieces of paper
managers:	making decisions on basis of accurate timely information; planning
operational staff:	improved work conditions, improved work output, in quality or quantity
system supplier	
development staff:	understanding actual needs
project manager:	link (translator) to supplier, ensuring problems identified, prioritised, addressed,
senior management:	success of implementation essential for future sales
patients	
out patients:	speed and knowledge of reception function, accuracy of appointment time and waiting for any other investigations/results
in-patients:	waiting time for admission, number of times questioned, knowledge of staff, information given, arranging transport
linked community	
employers:	time spent by staff on health care appointments,
other health care organisations:	links to primary care and home care services,
councils and mp:	co-ordination and provision of primary care home care & community services;
tourist board:	provision of services to visitors.

top of the organisation are committed to a project, and are seen to be committed, is critical to its success. CEOs will be responsible for the management of all major capital projects.

2.3.2 Appropriate resourcing of facilities, staff, staff time and development of all aspects of the project shows a serious commitment to the success of the implementation. This commitment may then transfer to other sections of the organisation, who will be encouraged to join the commitment with their own effort and the resources they control.

COMMUNICATION

2.4.1 Communication and involvement are essential in a major systems implementation; they will help overcome problems and fears associated with major change.

- It is almost impossible to 'over-do' communication.

- Formal communication channels that can be utilised include:

  - line-management channels;
  - formal project communications; and
  - staff communications, such as notice-board announcements and house journals.

- The risk of spreading rumours and half-truths has to be acknowledged.

- Good, informal systems can sometimes work better than formal ones.

- Informal does not mean casual: what is said, by whom, to whom must be chosen carefully.

2.4.2 To foster ownership, and utilise their expertise, staff need to be involved as much as possible in, for example:

  - the evaluation of supplier responses;
  - the review and development of procedures;
  - demonstrations and visits to reference site; and
  - selection of the supplier.

This consideration of risks and their management is in any case part of the business case. Project plans should incorporate regular risk review points.

MANAGING RISK

2.5.1 Effective management of the risks will be required in order to ensure that the preferred option is implemented to time and within cost. The issues that will need to be considered include:

- What action can be taken or planned now to prevent this outcome?

- What action can be taken or planned now to reduce the impact of this outcome should it occur?

- Is the cost, in money, time and effort, of the preventive action worth incurring?

Integration

2.6.1 Successful integration will entail consideration of a whole range of issues.

(a) Organisational issues

- information management;
  - requirements;
  - flows;
  - sources; and
  - technical standards.

- work roles:
  - responsibilities;
  - authority for activities, processes and decisions;
  - principles of teamwork: integrated work targets;
  - individual targets, roles within integrated targets;
  - access to information; and
  - professional boundaries.

- management of change:
  - physical change; and
  - communication with patients, community, other services indirectly affected, for example GPs.

(b) Technical issues

- interfaces and links:
  - links to existing systems, internal and external;
  - on-line or batch mode interface/link; and
  - degree of integration, e.g. order communications for hospitals and GP links.

- data:
  - data definitions, formats;
  - data integrity;
  - patient numbering; and
  - data interchange standards.

- sizing and capacity planning:
  - total volume flows;
  - future requirements; and
  - activity figures.

PERSONNEL/HUMAN RESOURCES

2.7.1 Clear policies on the expected management of staffing issues will need to be established and communicated. It is important to inform staff, even of less welcome news, and not to maintain an atmosphere of secrecy or uncertainty. Some common issues include:

  - redundancies;
  - staff reductions/freezing of posts;
  - changes in skill mix;
  - changes in work roles and responsibilities;
  - staff development programmes;
  - training other than that directly related to the IM&T implementation; and
  - rewards, renumeration, incentives and disciplinary actions.

Organisational Issues

2.8.1 A number of operational and organisational

questions arise requiring policy decisions. These include for example:

- centralised vs decentralised functions such as admissions and other patient administration system functions, coding, handling referrals and outpatients;
- standardisation in patient care planning, documentation, e.g. discharge summaries and reception functions;
- links to other initiatives, e.g. medical audit, Patient's Charter;
- procedures and protocols, e.g. complaints procedures;
- responsibilities for contract/budget management;
- management structures and responsibilities; and
- facilities management, including relationships with the supplier, the role of the supplier on site, impact on any existing local staff, the expected service levels; and local resourcing requirements may be affected.

2.8.2 The intrusion into the operational environment by accommodation and other works can be significant and requires management. Typically, factors and opportunities to be considered include:

- health and safety issues;
- electrical and cabling works (and any other developments to be implemented in parallel, e.g. voice communications);
- planning and co-ordinating physical changes;
- an opportunity for other physical changes;
- staff involvement in planning works;
- temporary (or permanent) relocation, or rearrangement, of operational areas and activities; and
- staff morale.

2.8.3 Early involvement of personnel departments in planning and implementation can help in planning staffing levels, thereby reducing redundancies and utilising natural wastage and short-term contracts. It will also facilitate resolution of staffing issues, including:

- staff development;
- job evaluation;
- recruitment;
- resourcing; and
- skill mix/transfer.

2.8.4 Representation from personnel departments on the project team may be appropriate.

SECURITY: CONFIDENTIALITY

2.9.1 Confidentiality is an aspect of system security which is likely to require policy decisions independent of technical system security and data integrity policies and controls. Confidentiality involves ensuring appropriate data access is confined to those who need to know, and have the appropriate authority to view, use or amend the data.

Attitudes

2.10.1 The culture and attitudes of staff are as important as technical considerations for maintaining confidentiality. Some positive and negative factors shaping attitudes to confidentiality of data include:

- respect for the protection and privacy of data;
- fear of reprisal for breaches of data;
- carelessness, or misplaced trust, e.g. leaving a terminal unattended, disclosing a password;
- other non-computerised access to the same data; and
- ownership of the data, affecting data quality and integrity.

Policies

2.11.1 Clear policies must exist to deal with confidentiality and breaches. Policies should:

- define explicitly the access allowed;
- indicate action to be taken in case of breach, e.g. disciplinary action;
- help guide those who are building the technical controls; and
- not be too restrictive, risking the loss of benefits of integration and mobility of information.

Technical Controls

2.12.1 A number of technical access controls are available, however, which will help confidentiality to be maintained. Technical solutions should not restrict normal operational activity. Some examples include:

- access controls to system;
- system audit trails;
- physical access controls to computer rooms etc;
- data accuracy/integrity checks; and
- network security.

2.13.1 *The NHS IT Standards Handbook* contains information on requirements and standards for security and confidentiality. These are some major issues concerning access and security.

- Access should not restrict smooth operational activity.
- Access provision should reflect patient and staff locations and movement.
- Access should reflect the level of authority, responsibility and operational need of the staff involved.
- Staff should be made aware of security policy, rules and regulations, and disciplinary procedures.
- Responsibility for enforcement of the Data Protection Act must be assigned and auditors should carry out regular checks on the security of information and access.

- Audit trails can be used to check access and system use.

TRAINING

Training Plan

2.14.1 This should form the overall framework for incorporating training into the project plans. (See Table 3.)

2.14.2 When planning training, the following points should be noted.Training needs include a large number of non-system related needs, such as project management, negotiation skills, management of change, etc.

2.14.3 The logistics of training a large number of staff by a given deadline requires early consideration.

2.14.4 Plans should allow for about two days intensive training, perhaps as half-day sessions, for each end user.

2.14.5 An acceptable trainer-trainee ratio for hands-on work will need to be defined.

2.14.6 Training facilities should be planned so that:

- each trainee has their own work station.
- ideally a duplicate of the live system can be used for training, (training systems with dummy data generally do not reproduce the range, complexity and absurdity of scenarios which occur in real life); and
- training facilities do not appear overly luxurious in comparison to other hospital facilities.

Training Responsibility

2.15.1 An on-going core training function has been created for most major systems implementations, initially managed by the project manager, but usually transferring to an existing local training function. Ideally, responsibility for core training should lie at the outset, with the local training function, to ensure ownership for the programme and incorporation into other training functions.

2.15.2 The line manager/business manager should be responsible for ensuring staff receive adequate relevant training. This responsibility should not be devolved to the training department.

Potential Training Issues

2.16.1 The logistics of planning, organising and delivering training have often been underestimated. Other typical problems include:

- the time between training and going live being insufficient for practice;
- a lack of keyboard skills;
- core trainers not being sufficiently trained;
- lack of staff cover for those on training;
- offers of extra training sessions not taken up;
- lack of understanding of the manual work process (e.g. care planning) before computer training takes place;
- the non-availability of clinicians for training.

SUPPORT AND HELP DESK

2.17.1 The support function needs to be at its strongest in the early stages of implementation. Core trainers can be used to provide this increased support. High priority should be given to:

- immediate resolution of user problems;
- full utilisation of available supplier support;
- help desk team competence and availability (not an answering machine); and
- provision of trainers/support alongside regular staff.

2.17.2 First line support is often provided by the core trainers, or departmental trainers/support staff.

2.17.3 Project staff/trainers should visit the end users at their workplace on a regular basis, even if no problems have been reported.

2.17.4 Key criteria for the help desk function include:

- provision of one single point of contact for help;
- help desk staff with a user background;
- on-call technical assistance;
- availability as operationally required, e.g. 24 hours a day; and
- all calls logged and followed up.

2.17.5 Some sites have used the works department as a first line technical support service.

USER MANAGEMENT

2.18.1 It is useful to consider user management explicitly as an issue, both before and during implementation. Two factors have been highlighted as critically affecting the success of implementation.

2.18.2 Staff expectations must be pitched at the right level.

- User expectations should reflect what the project can afford and deliver.
- The DSON should be realistic, rather than a 'wish list'.
- A long gap between project initiation and implementation can be demotivating, as staff do not generally see procurement process activities: progress must be communicated.

2.18.3 Local enthusiasts should be encouraged as:

- They can contribute in skills and as project champions.
- Their enthusiasm can be harnessed and directed.

TABLE 3 THE SCOPE OF TRAINING CONSIDERATIONS

Training Target Group	Training Need	Delivery of Training	Source of Training	Timing Critical path	Evaluation
End users	Computer/project awareness	Seminar	Core trainers Project manager	Before conversion	Random questioning/ Questionnaires to individuals or department
	Keyboard skills	Direct classroom	Core trainers	Before data conversion	Number of keying errors; competency certification
	Application software	Direct classroom	Core trainers	1 week before going live	Number of calls to help desk/support staff/trainers
	New working procedures	Seminar	Line manager	ongoing	Check paper management Informal visits
	Use of passwords/ security	Cascade	Line manager	2 weeks before going live	Time how long necessary to log-on Audit correct use Number of calls to help desk/support staff/trainers
Technical staff	Operating system	Direct classroom on-the job	Supplier	In advance of system 'go live'	Various
	Network management		Supplier		
	Database management		Supplier		
	Maintenance		Supplier		
	Report generation		Supplier		
	Reference file build		Supplier		
Key agents	Project management	Direct classroom	External/internal		
	Change management	Seminar	External/internal	As early as possible	How well change is adopted generally
	Negotiation skills	Seminar			
	Benefits management	Direct classroom	IMG E/internal	As early as possible	Evidence of structure of programme throughout organisation
	Quality assurance	Direct classroom	External		
Core trainers	Instruction techniques				
	Product knowledge		Supplier/ product specialist	2 months before going live	Level of retraining/Level of understanding of system and application functions
	Presentation skills	Course			
Application co-ordinators	Preparation of materials	Classroom		1 month before going live	Course evaluation surveys
	Application skills	Attend other courses			Level of dependence on supplier
	Systems skills	Local college			

- However, they may develop fringe factions if not controlled.

2.18.4 Computer systems demand, and enforce, a more disciplined approach than many manual systems. This improves consistency of procedures and quality of data, but staff may find it difficult not to continue with previous informal procedures.

PAPER MANAGEMENT

2.19.1 The use of paper records and forms must be reviewed. One hospital had over 190 different paper forms on one ward. IT can help rationalise this, but management may be required to ensure manual paper-based processes do not persist alongside the IT.

2.19.2 Users should be educated to use the system for information: the system should be more accurate, and information should be easier to locate than with paper-based information.

2.19.3 Users will be reluctant to throw away printed copies of reports, etc, where these were vital in the past. One site has printed the following text on top of some of the computer generated reports: 'PLEASE DESTROY THIS SHEET WHEN THE UPDATE IS PRINTED.'

2.19.4 Other issues include:

- the most appropriate location for printing the paper record;
- changes to pre-printed forms and special layouts; and
- the acceptance of electronic signatures

INTEGRATION ISSUES

2.20.1 In order to integrate a new system successfully it will be necessary to:

- review policies and procedures on a multi-disciplinary basis;
- identify areas of duplication of data and activities; and
- consider processes and points of interaction of different staff, patients, and services.

2.20.2 Some sites have held 'integration days', in which a scripted scenario, perhaps presenting a complicated patient, for example, is used to identify key interaction and integration issues for a group of staff drawn from all likely areas of involvement with the script. This technique helps identify formal and informal protocols and procedures that already exist, whether they are appropriate and which new ones are required.

COMMUNICATIONS

2.21.1 A communications strategy should be part of the project plans, identifying methods, target audiences, timing and content of communications as well as resource implications and responsibilities.

2.21.2 The strategy should incorporate internal and external communication. Patients, GPs, the community, the Trust board, purchasers and others all have an interest.

2.21.3 It is essential to keep everyone well informed of the progress of the implementation. All management levels should be responsible for cascading information to their own staff within the organisation.

- Information can be provided in the form of newsletters, talk-ins, briefing packs, awareness sessions, and, eventually, information on-line or on E-mail.

- Using of existing formal and informal communication networks is most effective.

2.21.4 The timing of communication in the implementation process is important, too much information too soon can have a demoralising effect if delivery is delayed.

2.21.5 Points to consider when planning awareness sessions and other briefings include:

- the purpose of the session;
- the target group;
- responsibility for preparation and delivery;
- frequency;

TABLE 4 ISSUES IN MANAGING CHANGE

Ground rules for change
• Identify key area/process for change. • Set goals and objectives and define future state. • Obtain agreement from senior management, others affected. • Appoint team leaders and team members to tackle each area in detail. • Develop action plans. • Implement changes.
Success factors for change
• Visible top level commitment (demonstrated by participation, adequate resourcing, agreed policies, and making decisions). • User ownership of goals. • User ownership/control of process of change to reach goals.
Tactics for change
• Prepare staff by making them aware. • Select key change agents, make them responsible. • Allow time – organisational change will take longer than technical implementation. • Involve those who could be resistant to change and allow them to express themselves. • Obtain acceptance of change.
Barriers to change
• Lack of communication, uncertainty. • Lack of leadership. • Threat to job security. • Inadequate training. • Resistance to computer use (fear).

- scheduling;
- content;
- information required; and
- presentation media and locations.

2.21.6 Seminars and open days can be provided for staff and others. These should be well planned, well focused, and well publicised.

SUPPLIER MANAGEMENT

2.22.1 Contracts are often awarded under prime contractorship. All contractual issues must be handled through the prime contractor, unless otherwise agreed in writing by both parties.

2.22.2 In practice, technical and practical issues are often dealt directly with third parties and sub-contracted suppliers. Although this may provide expedient solutions, the prime contractor should always be kept informed, in writing, of any such contact, and must agree to any changes which affect the contract.

SUPPLIER PROJECT MANAGEMENT STUCTURE

2.23.1 The supplier project management structure usually consists of a site project manager who may be on site two or three days a week, depending on the stage and type of project.

2.23.2 Day-to-day control over the availability of supplier representatives to attend meetings or be on site when required is often limited, and should be scheduled in advance. Technical staff are more likely to be on site on a regular basis.

2.23.3 Some suppliers have their own implementation framework. Before agreeing to its use, its applicability and flexibility needs to be assessed; there should be no conflict with the contract.

2.23.5 The schedules to contract should define the roles and responsibilities of the supplier and the hospital. In practice, this will need to be discussed and agreed at an operational level.

2.23.6 It can be useful to invite supplier representation to project board meetings, on an agenda item basis.

2.23.7 The roles and responsibilities in the supplier's project management structure should reflect those within the contracting organisation, to facilitate communication.

2.23.8 Suppliers need to be made aware of the corporate view and operational needs of the client site, for example, through direct involvement with end users at appropriate review points and briefing sessions with senior management.

CONTRACTUAL ISSUES

2.24.1 Problems are initially passed up through the project management structure and then to senior management within both organisations, if deemed necessary by the project board.

2.24.2 Contractual issues with third party suppliers are managed through the prime contractor. Direct contact with the third party supplier should be only with the agreement of the prime contractor.

2.24.3 Distance can be an issue with foreign suppliers if difficulties occur, and little or no local support is available. Determine and agree arrangements that are convenient – these should be contractual.

2.24.4 Contracts must be very specific as to what is expected in terms of delivery and how problems are to be resolved, with well-defined responsibilities and procedures for escalation. All parties stand to gain from clear and well-defined contracts.

SUPPLIER FAILURE AND NON-DELIVERY

2.25.1 Supplier failure is uncommon but can be spectacular when it occurs; the evaluation procedure prior to awarding the contract should have established supplier capability. More likely is failure to deliver the full contract, for example non-delivery of a module. This reduces confidence in the supplier's ability to deliver, and may require a formal reduction in scope, or seeking an alternative. Remedies will need to be explored to ensure that, in the event of a failure, adequate safeguards are in place. The means by which such difficulties may be resolved should be detailed in the contract.

2.25.2 If delays are likely through software development and testing, the supplier is expected to provide extra resources to avoid this situation and keep to timescales. Damage limitation may be exercised by:

- formally reducing the scope; or
- accepting what is available, with the proviso that the remainder of the product is available at a later date.

2.25.3 Payment should be authorised only on acceptance of the completed product.

2.25.4 There is usually sufficient leverage in the payments profile to allow retention of payments until the situation is rectified. Exceptionally, further escalation may be required referring to contractual penalty clauses, for example, liquidated damages. Negotiation on other payments or deliverables may take place. Ensure all negotiations are documented and contractually binding by adhering to change control procedures.

System Interfaces (Between Applications)

2.26.1 Requirements for interfacing need to be established in the Schedules to Contract. They are usually more complex than expected from a cursory review. Performance and acceptance criteria for interfaces should be clearly defined.

2.26.2 Ideally, the prime contractor will have full responsibility for ensuring interfaces are delivered and meet specifications.

System Documentation

2.27.1 The supplier is expected to supply complete documentation for the system, such as technical and system guides for system management, user guides for the applications, documentation on system security, and the report generator.

- Documentation is not usually site-specific. In particular, US suppliers may provide documentation relevant to the US version.
- There are few documentation standards. Some suppliers carry out a quality assurance on their documentation before publication.
- Documents are often application-specific without addressing the integration aspects of the system.
- Version control of documentation, synchronised to systems and applications releases, is often inadequate.

Supplier Relationship

2.28.1 A good relationship is formed when both sides work as a partnership. However, all decisions must be documented to maintain the formal basis of the relationship.

2.28.2 Suppliers may not have extensive experience of implementing large integrated information systems in the NHS. Furthermore, functionality across all NHS organisations is not standard. Suppliers must become familiar with the business circumstances of the client site.

Non-UK-based Suppliers

2.29.1 Non-UK suppliers, typically from the US, are not always fully aware of NHS requirements or how differently the NHS and UK hospitals work compared with their own.

- The supplier may rely on the hospital to specify their NHS statutory information requirements and will need to be flexible to adapt to changes.
- Locally available support needs to be agreed, especially if there is no UK base and time-lags are involved between their headquarters and the UK.

2.29.2 Many foreign suppliers are now employing staff who come from NHS backgrounds to overcome these problems.

Technical Management

Introduction

2.30.1 IT departments, and particularly the staff of IT suppliers, have attracted the reputation of lacking sensitivity to users, needs and circumstances. Closer consultation and planning are needed. IT staff could be invited to shadow users to broaden their awareness of user issues.

2.30.2 Staff need to be made aware of the implications of installing networks and hardware: there will be disruption.

Installation

CENTRAL HARDWARE

2.31.1 Central hardware is usually delivered direct to its final accommodation.

2.31.2 Supplier engineers or local staff install and check equipment to ensure it is in working order. Installation and acceptance of all equipment must be documented for:

- the asset register;
- support and maintenance; and
- the payment of profits.

PERIPHERALS

2.32.1 PCs, VDUs, workstations and printers may be installed by the supplier or the IT department, depending on local arrangements. Storage facilities will need to be provided if a stock is held to be called on during roll-out or to replace malfunctioning units. Inevitably, supplier and hospital staff end up finishing the installation late on a Sunday ready for going live on Monday. Even the 'trivial' aspects of installation of peripherals should not be underestimated:

- The installation should conform to electrical safety standards and standards on interference.
- The right units need to be moved to the right location.
- The units need to be 'wired' in, made secure and tested.
- The packaging must to be removed.
- Support staff and spare peripherals should be ready for going live.

NETWORKS

2.33.1 Networking environments vary across sites: some have installed fibre optic networks for resilience; many have mixed networking environments, e.g., X25 and Ethernet.

Computer Environment, Accommodation and Site Surveys

2.34.1 The site is usually responsible for ensuring that the environment for computer hardware is adequate to ensure a stable working environment. The supplier should be able to assist with advice on space and ventilation requirements, and false floors required, etc. The estates department and the local health and Safety officer may be able to help and advise. Costs need to be assessed. If significant disruption is expected, staff will need to be kept informed. When planning the new computer

environment, it may be prudent to consider other systems already installed.

2.34.2 For most computer installations, including workstations (see also Table 5), central hardware accommodation, and any shared facilities, a site survey should be conducted to ensure that the following environmental conditions, and all site requirements, are satisfactorily addressed. A nominated number of staff should be responsible for ensuring that EC regulations regarding accommodation and environment are met.

2.34.3 End-users must also be made aware of their own responsibility for the ergonomics of their environment. They may drift into bad practice in their use of equipment and need to be re-educated at a later date.

SUPPLIER ACCOMMODATION

2.35.1 The supplier may want to or need to maintain a base on site for the duration of the project, in which case accommodation, telephones and equipment must be budgeted for and arranged.

Standards

2.36.1 Products from most manufacturers comply with EC guidelines. Many manufacturers are working towards quality standards such as ISO9000, or using approaches such as Total Quality Management. Compliance will be required with standards as described in STEP (see Appendix 2) within the NHS.

2.36.2 These standards are described in detail in the NHS IT standards handbook.

2.36.3 The Schedules to Contract will have indicated the type and number of peripherals required. Network requirements should have been identified.

2.36.4 The Works department may be involved in effectively and safely siting peripherals. Planning should be conducted early (pre-implementation) and in conjunction with any physical alterations required.

2.36.5 Consideration should be given to any improvements needed in voice communications (telephones) during any work for datacomms.

Maintenance

HARDWARE

2.37.1 Support and maintenance for hardware, including networks, can be provided through:

- a facilities management (FM) contract with an external supplier, especially for central hardware; and
- in-house maintenance.

2.37.2 A number of organisations prefer to maintain their own IT department, thus controlling the IT support function in house. Others feel that IT expertise is best contracted in. Useful arrangements have included placing some IT expertise within the works department, for routine maintenance, for example. These options need to be fully costed, and the benefits and risks assessed.

TABLE 5 WORKSTATION DESIGN

1. Investigate

   - equipment to be used
   - other activities that take place at the workstation
   - the layout of the workplace
   - the user population

2. Establish requirements:

- space
  - direction of door and window openings
  - access to doors and windows, switches and sockets
  - corridors and throughways
  - access to fire fighting/warning equipment
  - privacy for user access
  - noise
- power
  - smoothed power supply
  - emergency power to CPU, and other critical elements of the system, e.g. network controllers or certain peripherals
- furniture
  - layout in relation to fixtures and operational needs
  - adequate storage
  - ergonomics of seating and workstations
  - lighting, glare
  - ease of cleaning
  - stability and robustness of workstation
  - independent of handedness (left or right)
- ventilation, heating, temperature, humidity, lighting, drafts and noise
  - impact on operational environment
  - conditions for central hardware operation
- interference to and from other medical, laboratory or communications equipment
- positioning of electrical supplies and cable runs
- fire protection
  - smoke alarms
  - fire extinguishers (check local regulations)
- security
  - access to room
  - locks on equipment
  - level and frequency of access required
  - physical security
  - security of data, e.g. from printers or on screen
- ergonomics, and health and safety
  - other workstations considerations: refer to the health and safety regulations, and local policies.

2.37.3 The system manager and operations staff are usually responsible for maintenance of the system, except where the operation is run under an FM agreement. FM may be available from the supplier, or from a third party.

2.37.4 All planned maintenance should be scheduled to take place out of normal working time, and all relevant staff informed. Where systems are run in fail-safe operation, one half of the fail-safe set is dropped from the system and the primary machine used to run the system. All data is restored from one machine to the other.

2.37.5 Where the system is run in dual operation mode with mirrored disk storage, the amount of unplanned down-time should be reduced. Down-time procedures must be devised at the same time as new procedures are designed.

2.37.6 A common requirement, which may be a significant change from current practice, is 24-hour operation, preferably with no down-time, planned or unplanned. Close consideration should be given to which elements of the computer system, maintenance and support should be on full 24-hour cover, on-call cover, or 12-hour cover.

2.37.7 Technical management issues will have more or less relevance depending on the extent to which technical support is contracted in from the supplier with facilities management (see Appendix 2).

Management

NETWORK MANAGEMENT

2.38.1 Using mixed networks may incur higher maintenance and management costs.

2.38.2 The tasks involved in network management include:

- day-to-day running of the network, including naming and addressing control, administration and monitoring network security;
- capacity planning of the network;
- responding to faults; and
- providing advice, support and guidance to users.

2.38.3 Monitoring and management tools and systems may by supplied as part of the network installation. These may include the following, though their use will be affected by local procedures and requirements:

- utilisation of the network, status of devices connected;
- collection of node configuration details and automatic alarm condition reporting;
- response times and other performance parameters, central fault finding, and error reporting;
- back up and restore facilities; and
- availability of network.

2.38.4 Records should be maintained about access levels, user profiles, performance and utilisation. Many network management tools enable this to be done on the system.

DISASTER RECOVERY

2.39.1 The supplier's and local IT staff should be given adequate time to test the system, learn to operate it, and simulate disasters and test recovery procedures. Days or weeks, rather than hours, are needed.

2.39.2 There are many options to reduce risk of disaster damage.

- Install two smaller CPUs instead of one large one, with different systems on the two machines. In the event of hardware faults on one machine, the operational systems can be loaded onto the other machine.
- Ensure back up procedures are thorough and conducted as planned.
- Negotiate appropriate service level agreements with the supplier.

Antivirus Procedures and Copyright

2.40.1 There are a number of distinct threats to system security, including viruses, worms and bombs.

2.40.2 Policies on PCs and software must cover copyright laws and antivirus procedures. Some basic rules should apply:

- All PC software should be virus checked before loading.
- No member of staff should be allowed to use a floppy disk on the system until it has been checked for viruses.
- No unauthorised software packages should be allowed on the system.

2.40.3 If necessary, floppy drives can be disabled to prevent misuse.

2.40.4 Regular audits of all PCs may be required to ensure that the policies are being carried out.

SECURITY: ACCESS CONTROL

2.41.1 Policies and other issues relating to security have also been discussed in Key Issues, Section 5. These are also the subject of a special report prepared by the IMC.

PHYSICAL SECURITY

2.42.1 Access to the computer rooms and equipment must be restricted physically to authorised personnel either through multi-level locking systems or, for example, by electronic card entry.

2.42.2 Peripherals may need to be physically secured, and coded or marked. A register of equipment and its movement should be kept.

ACCESS CONTROL

2.43.1 The system will store information which is increasingly important to the running of day-to-day operations within the hospital, providing information for improving patient care, for contracting and statutory returns.

2.43.2 Controlling access to the computer systems is essential to the good management of the system. A data security policy should ensure that all staff are aware of the importance of data security (see paragraphs 2.9.1-2.13.1). Access to the system needs to be protected by a number of different levels. Operating systems access is restricted to key personnel, usually within the IT department.

2.43.3 Access to the computer system in most cases is through a combination of codes and passwords, often in conjunction with terminal access restrictions. Access to functions can be limited by a further identification procedure before the action requested can be performed. Access can be restricted to a number of levels, e.g. read only, insert, amend, delete.

2.43.4 Users can be grouped according to the functions they require to carry out their daily tasks.

PASSWORD ALLOCATION

2.44.1 Password allocation should be dependent on end-users having completed training, and proved competent in using the system. Passwords can be issued in sealed envelopes and should include a note on organisation policy on security and misuse of passwords.

2.44.2 New users must be notified to the trainers and given training before being allowed access to the system. The system manager should also be notified of staff leaving, either by personnel or by the department concerned, so that their access to the system can be deleted. Changes to access levels required by staff members should be made in writing, appropriately authorised.

2.44.3 Staff should be encouraged or forced to change passwords at frequent intervals. Some systems allow management to set time limits on how long passwords are valid and users are warned in advance that their passwords are due to expire.

2.44.4 Unauthorised release or use of a password can be prosecuted under the Data Protection Act.

AUDIT TRAILS

2.45.1 Each security system has audit trails to monitor the use of the system. Monitoring and checking the system can be time consuming. Identification of unauthorised access attempts may be available on some systems.

2.45.2 Auditors should be very strict about security and access arrangements, and monitor the situation closely.

Implementation Approaches

2.46.1 Terms commonly used to describe the approaches to implementation include:

- phased — incremental implementation of functionality or modules;
- piloting — implementation of functionality in one or a few pilot areas, before roll-out to rest of organisation;
- big bang — implement system simultaneously across all wards, or departments, or functional areas. That is, a specific module or application goes live simultaneously in the whole organisation where that functionality is relevant. In practice, the system will need to be tested thoroughly before going live;
- prototyping — relevant to development systems, or when tailoring a product. The product (e.g. module, screen, report, etc) is tested for its technical and user acceptability within a defined area before implementation, usually by piloting.

2.46.2 The choice of area for piloting and roll-out, or starting a big bang, will depend on a number of factors: high early benefits; skill level; capacity to cope; local resources; timing; geographical/technical factors; local morale/champion; local pressure/politics; system functionality/applicability/dependency; likelihood of success; ease of implementation; and business objectives.

2.46.3 There are further subsets of implementation options depending on policy:

- decentralised vs centralised;
- extent of devolvement of PAS;
- who codes, who orders, who is authorised to amend data; and
- screen designs, pathways, menus.

2.46.4 The issues are likely to be corporate in nature. Senior management involvement is essential.

DEVELOPMENT vs PACKAGE SOLUTION

2.47.1 The system to be implemented can be a full turn-key project, or an off-the-shelf package at the other extreme. More commonly, it will lie somewhere in between, with elements of development required in, for example, interfaces and application areas. In practice, any system will require some tailoring.

2.47.2 Some of the advantages and disadvantages of the extremes of approaches to be implemented are indicated in Table 6.

Development Requirements

2.48.1 A number of suppliers will only be able to meet a percentage of contracted requirements by recourse to off-the shelf products. Inevitably, some products may need development. The supplier may be asked to develop or tailor a product to meet specific needs. The 80:20 principle should be considered: drawing a balance between accepting a solution which delivers most of the functionality, against the additional cost and effort of trying to obtain a 100% solution. Factors include:

- cost of development;
- overheads in obtaining support for a product which may no longer be compatible with the supplier's national products; and
- project timescales are also likely to be affected.

2.48.2 Where no product previously existed, development work may result in a new national, marketable product. The NHS can usefully participate and contribute in such development. This will inevitably be a higher risk, higher cost solution, and will affect timescales. Resource commitment will have to be assessed, against any potential returns negotiated with the supplier.

SYSTEM TAILORING

2.49.1 Tailorable options are available in most of the systems implemented. Tailorable items include:

- system reference files and tables, e.g. consultant codes, location codes, radiology investigations, order sets;
- data entry screens can also be user defined, for example, for order entry; and
- user-defined reports as well as standard reports.

DATA CONVERSION/TRANSFER

2.50.1 Usually the system to be implemented either replaces existing computer systems or manual systems. In both cases, there will be data to be transferred from the old system to the new system. Problems may occur with:

- incomplete or incorrect data;
- inconsistency in references codes/files;
- the conversion process (corruption or incompleteness of data);
- links to other systems, internal and external; and
- handling prospective data, e.g. admissions or appointments.

EXISTING COMPUTER SYSTEMS

2.51.1 Most data conversions are managed via a file transfer process. Often, the complete existing database is converted, including duplications and errors. Effort is then expended after conversion to 'tidy up' the new database. A prime requirement is to audit the existing database prior to conversion.

2.51.2 Standalone systems will have their own numbering, coding and reference file structure. These may be converted at source to map to the main database, or a conversion routine can be incorporated into the interface. Both technical and user-related issues may influence the choice of action.

MANUAL SYSTEMS

2.52.1 Existing manual records may go back many years. The time and effort required to load this data must be weighed against the usefulness of the data. Often, only a certain number of recent years' data is put on the database, and manual records retained for the remainder.

TABLE 6 IMPLEMENTATION OPTIONS

	Development/Turn-Key	**Off-the-shelf Package**
Time to fully implement	Lengthy (> 3 years)	Faster (< 3 years)
Cost	high if initial/first site/only site higher risk of uncertainty of costs	well defined, usually cheaper
Facilities	full functionality as specified should be possible	available functionality may not match specification completely
Final product quality	higher risk of uncertainty, though potentially very good	can be checked
Type of implementation	phased or big bang, though it lends itself to phototyping/phasing approach.	phased or big bang, though it lends itself to a fast track approach
Delays	higher risk of project delivery date delays and uncertainties	less risk of delays, though system upgrades and new releases are at risk of delay
Using other sites' experience	experience can be used to design new systems to avoid repeating mistakes and problems	can learn and share from implementation at other sites, saving time and resources (e.g. documentation)
Resource requirements	high greater need for hospital involvement in specification and design can lead to greater →ownership, IT skills	less hospital staff involvement in design, less resource intensive but potentially less ownership of product

PARALLEL RUNNING

2.53.1 Parallel runs have been carried out on some systems, usually PAS, until the data have been verified and checked. This results in duplication of effort and files out of sync, and should be avoided or performed for as short a time as possible.

2.53.2 Data may not match completely across both systems due to different verification procedures, operational procedures and data entry screens.

DATABASE MAINTENANCE

2.54.1 The complex nature of a large database usually requires that it should be managed centrally. The database administrator or manager is responsible for the following:

- creation and maintenance of global data, coded tables, reference files;
- access controls;
- data integrity;
- software release control; and
- problem escalation.

2.54.2 System files and coded data tables may be central to all systems or may be local to a department. If the files are central to all systems, agreement should be reached with all users as to the codes acceptable for the systems. These files should be managed centrally, since any amendments may have major implications for the system database. Data relevant only locally, such as order sets, can be created and maintained at a local level.

2.54.3 Resources will be required for the creation and maintenance of this data.

CHANGE CONTROL

2.55.1 Standard change control procedures should be agreed between the hospital and supplier. These should have been defined in the Schedules to Contract.

2.55.2 No changes should be processed without change control procedures being invoked, whether it be a change in timing (e.g. payment schedules), specifications, or any other change which has an impact on the project.

2.55.3 Change control procedures should be linked to cost monitoring to allow the changes to be reflected in overall project costs.

2.55.4 Standard forms should be devised which document the changes required, assess impact and provide costs associated with the changes.

2.55.5 Three decisions may arise from change control procedures being invoked:

- acceptance, with priority attached and date for completion;
- deferment, until when and reason; and
- rejection, with reason for rejection.

ACCEPTANCE

2.56.1 Descriptions of the acceptance tests to be performed, and the criteria by which implementation of the system and completion of tasks will be measured, are included in the schedules to the contract. Acceptance procedures will be refined early in the implementation process.

2.56.2 Acceptance tests may be required for:

- availability;
- functionality; and
- performance.

2.56.3 The supplier is expected to perform acceptance testing of their application software products prior to release to the site. It is difficult to assess how adequate the supplier's own system testing is because their machine configuration and versions of software utilities are unlikely to mirror those on site.

2.56.4 Typically, acceptance will be in stages:

- as a standalone module;
- linked to other modules; and
- fully integrated.

2.56.5 Differing levels of provisional and final acceptance would apply.

2.56.6 Sufficient resources and time should be allocated for acceptance in the project plans. Acceptance testing should be scheduled well in advance of going live.

2.56.7 As the level of detail specified in the SON is open to interpretation, the system may perform the functions required, but not in a manner acceptable to the user. The supplier has an interest in the acceptability and hence success of the product, but user expectations may need to be managed locally.

ACCEPTANCE TESTING PROCEDURE

2.57.1 New software, and any software updates, should be tested in an isolated environment. Under no circumstances should the software be loaded onto the live system until it has been tested and accepted.

2.57.2 'Acceptance testing packs' for each of the acceptance stages can be used to standardise and facilitate acceptance testing, thereby improving quality. The pack might include:

- definition of acceptance criteria;
- software testing proforma, possibly a script depicting a typical scenario;
- test data files;
- appropriate sections from the schedules;
- amendments from the tender documents; and
- procedures for acceptance testing.

2.57.3 Test scripts can be prepared and agreed with the supplier and may reflect the demonstration scripts used in the supplier evaluation phase of the procurement.

2.57.4 Testing should be carried out in a structured manner, with any issues documented and raised formally after each session.

2.57.5 From the test a catalogue of all faults and inadequacies should be noted, with solutions placed in two categories, mandatory or desirable, and mapped against what was expected in the SON. Problems should be categorised and prioritised in consultation with the acceptance team and supplier.

SOFTWARE FAULTS

2.58.1 An attempt should be made to confirm all software faults reported, if possible by duplicating the reported fault, and obtaining as much information about the circumstances as possible.

2.58.2 All faults should be logged using standard documentation and presented to the project manager for review. These formal procedures are necessary to avoid faults being reported ad hoc by users to the supplier. If proper channels of communication are not observed, problems may not be resolved or duplicate reports may be made, problem analysis will not have been conducted, and bug fixes may be made without formal notification or consideration of the consequences.

2.58.3 When the fault forms are reviewed, the problem may be identified as relating to:

- user knowledge or procedure;
- software functionality;
- software fault;
- hardware functionality; and
- hardware fault.

2.58.4 If the problem is user-related, there should be procedures for providing training and support to avoid recurrence of the problem. Help desk, training and support functions may need to be reviewed.

2.58.5 If the problem is not user-related, the fault should be raised with the supplier. It may not always be obvious whether a software or hardware fault is being observed. The problem should be checked against the schedule to see if the site has any leverage with the supplier.

2.58.6 If a mandatory fix or development is required, the fault should be raised with the supplier through problem control. Agreement should be reached on how bug fixes should be tested and implemented.

2.58.7 The supplier response may be that development is required beyond the original specification, and therefore change control procedures need to be invoked.

2.58.8 When problems and change control notices arise, the supplier, in conjunction with the NHS organisation, should agree their status and priority and, where relevant, resources required from either party. The lists will need to be regularly reviewed, taking into account any new releases, other change controls, or changed priorities.

2.58.9 The supplier will normally test any developments or fixes, and then supply them on tape or by dialling-in, to be loaded onto the local test environment. This may be done in conjunction with a new release of software.

ACCEPTANCE OF FIXES AND NEW RELEASES

2.59.1 A major release should be scoped technically to identify the impact on other modules already implemented; user implications also have to be assessed. The acceptance process for new releases and bug fixes follows the same procedure as software acceptance in general. In addition, the following procedures should be carried out:

- retrieve all software fault forms related to the system;
- note any development changes or new features in the release;
- perform upgrade functionality/availability/performance testing;
- map changes back to fault reports;
- report on acceptance and any further/remaining faults; and
- if there are any training implications, load onto training account and perform training.

2.59.2 Usually, the project manager is responsible for acceptance of system, on the advice of the acceptance testing team. The project manager maintains the fault log and raises the issues under problem control with the supplier. The list may be prioritised in discussion with the supplier. Acceptance should not normally take place until all issues are resolved. This does not preclude going live, usually under some form of provisional acceptance, and possibly commencing payments to the supplier.

New User Requirements

2.60.1 New requirements may arise in one of three ways:

- functionality expressed in the DSON and SON was not sufficiently specific;
- the functionality is delivered but user expectations have changed; or
- additional or changed requirements not originally considered.

2.60.2 The requirements may be passed to the IT department, project manager or application team leader, as appropriate, and the DSON/SON checked for the original requirements. If an item from the DSON/SON is missing from the functionality, then the supplier may be requested to provide the facility.

2.60.3 Any enhancements or modifications to application software should be subject to the usual change control procedures and may have a cost attached. The supplier is asked whether the development could be made available; if agreed, a specification is produced and priced. The site then has the option to agree to the development.

2.60.4 Though suppliers cannot be expected to meet all new statutory requirements as they arise, there should be an understanding of the flexibility required to be able to do so. The organisation should establish the degree of flexibility available; typically this will be required in disease and procedure coding, patient demographics, and reports. If the supplier intends to remain in the NHS market, the enhancements are likely be made eventually. The procedure and cost for incorporating these for existing clients varies among suppliers, and should be negotiated as part of the original schedules to contract.

2.60.5 Some suppliers incorporate enhancements developed through user groups into the product either at no cost or as a shared cost.

Information Management

2.60.1 Information is a valuable asset of the organisation, because it is a corporate resource which can be shared.

2.60.2 Information from systems can often be produced in the form of standard reports (either printed or viewed on screen), and through report generators which interrogate the system via a series of queries.

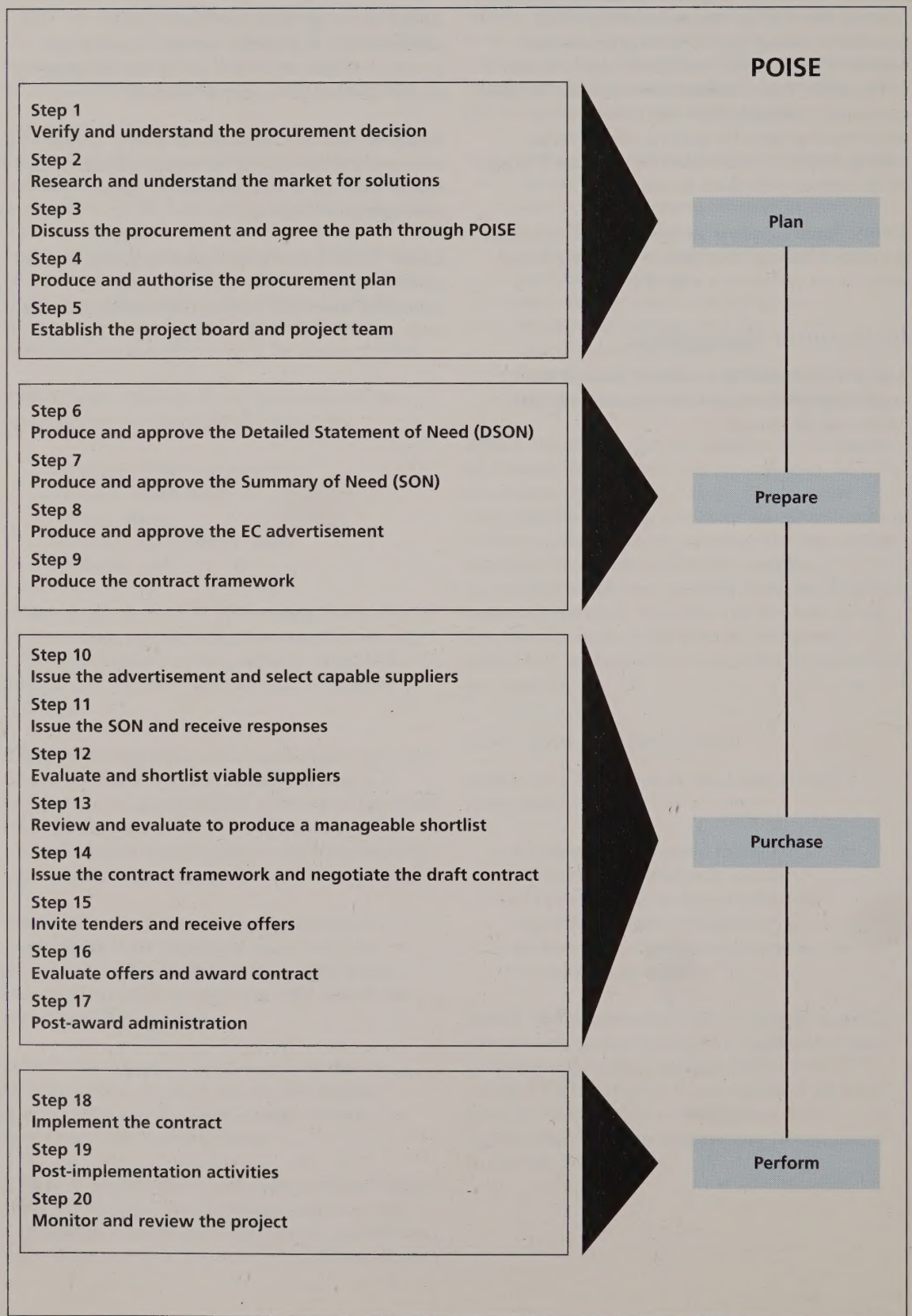
2.61.3 If non-technical staff are to have the facility to use a report generator, it should be user friendly and require a low level of IT expertise. Otherwise, a support function may need to be provided. An understanding of the database structure may be needed to obtain best use of the report generator.

2.61.4 From the point of view of the IT department, it is essential that strict control and access limits are put on the use of the database for ad hoc queries and report generation.

2.61.5 If database interrogation affects on-line performance, the system (database) administrator should have the ability to interrupt, either suspending or deleting jobs.

2.61.6 Control can be exercised by giving limited access to subsets of the query language to authorised users and limiting the machine time the users are allowed for generating ad hoc reports.

Appendix 1: POISE Methodology – Twenty Steps



Appendix 2: An Introduction to STEP

STandards **E**nforcement in **P**rocurement

STEP promotes improvements in the quality of the IM&T systems purchased by the NHS through national procurement standards. Commencing in one of the NHS Supplies Authority's regions in April 1994, with a view to full use across the NHS by April 1995, STEP comprises a supplier compliance questionnaire coupled with the NHS *IT Standards Handbook*.

These initiatives will:

- enable suppliers and purchasers to understand national IT standards;
- encourage suppliers to develop products which comply with national IT standards; and
- enforce the specification of, and compliance with, national IT standards as part of all IT procurements.

Why Does the NHS Need National IT Standards?

National standards are essential to meet the objectives of the national IM&T strategy. They:

- improve communications to support seamless patient care and internal trading.
- secure value for money from IM&T systems by procuring those which are fit for the purpose in terms of quality, portability, security and useability.

Standards are an important factor in ensuring that NHS organisations comply with legislation covering health and safety, international trade and data protection.

How is Compliance to be Achieved?

Compliance is achieved through completion of a questionnaire by suppliers, in which they will affirm (or not) compliance of the products and services with national standards. The content of the questionnaire will be reviewed each year and standards compliance will be required after consultation and when it will not unduly restrict the purchaser's choice of products.

The NHS *IT Standards Handbook* will support the procurement questionnaire. It will provide the definitive statement of national IT standards and give detailed guidance on the use of the procurement questionnaire. A source of general reference about IT standards relevant to the NHS, it will be published in four volumes:

Vol.1: *Introduction to IT standards.* Information about IT standards-making bodies, standards and the law and standards in medical informatics.

Vol.2: *NHS IT standards.* Background material on IT standards referenced in the procurement questionnaire.

Vol.3: *Reference database.* Basic information on all standards relevant to IM&T in the NHS. It will be maintained on FOXbase and distributed on diskette.

Vol.4: Guidance notes. To accompany the procurement questionnaire and explain NHS policy and standards in each area covered by the questionnaire. Also, advice on the completion and interpretation of the questionnaire.

Scope of Questionnaire Version 1 and Handbook

The first version of the questionnaire and handbook will cover the following IT standards areas:

- quality standards – BS5750
- standards for information exchange
  - NHS data and coding standards
  - EDI messaging
  - message handling
  - end systems connections to WANs and LANs
- Open System standards
- local and wide area network standards
- safety
- security (availability, integrity, confidentiality)
- useability (the human/computer interface – HCI)

Appendix 3: Approval Criteria Checklist

Checklist of criteria considered and documentation required for substantial IM&T investments (EL 94 22 refers)

	Criteria	Documentation required
1	That the investment is part of an overall IM&T strategy based on the organisation's business plan.	Where a strategy encompasses a step-by-step process for implementing systems, then that should also be provided. An inventory of major systems and significant ongoing projects should also be provided. The organisation's IM&T strategy should be included as supporting documentation for the investment proposal.
2	That there is a properly structured business case based on good investment appraisal and realistic scheduling, with staged review points.	The Full Business Case should be provided.
3	That account has been taken of achieving the same benefits from better use of existing assets.	Within the business case submitted there should be details of all the options required together with reasons for their rejection.
4	The benefits (cash releasing and non cash-releasing) have been properly and realistically identified and assessed with a commitment from the affected parties to their realisation.	The documentation should list the benefits to be achieved, distinguishing between cash-releasing benefits, resource-releasing (but not cash-releasing) benefits and non-quantifiable benefits such as improvements to patient care. The business case should contain details of cash releasing and quantifiable benefits and must include clear evidence of the commitment of the major affected parties to their realisation.
5	That a full assessment of the risks surrounding the investment is carried out at an early stage together with an evaluation setting out how sensitive options are to change in the underlying assumptions that have been made.	Tables setting out the sensitivity analysis and risk analysis (see Vol 3 *Investment Appraisal and Benefits Realisation – Small Projects Guidance* Stage 3).
6	That there is a clear understanding of the procurement process.	Documentation should confirm that the major steps in the POISE guidance have been taken up to and including tender evaluation and that the remaining steps will conform to the guidelines. Other supporting documentation such as the Summary of Need (SON) is not required but should be available if requested. Pre-tender – the business case should outline the credentials of the short listed suppliers and their financial viability. Post-tender – all business cases should be submitted for final NHS Executive check post-tender before the contract is awarded. The business case should be accompanied by: • a brief commentary detailing and changes in the viability of the business case; • the minutes of the tender evaluation board meeting together with details of the evaluation criteria set pre-tender and the evaluation scoring table identifying the preferred supplier. In particular the NHS Executive will need to be aware where costs have risen by 10% or more, where there is a significant change (reduction) in the benefits to be delivered or in the assessment of risks (increased risks).
7	That the investment as a project will be handled in a structured manner (PRINCE being the NHS standard methodology).	Details of the PRINCE management structure together with details of who will be filling the key roles. Evidence that those involved have the appropriate level of awareness/training for their roles.
8	That there is an unequivocal commitment from the Chief Executive and Board Chairman and clear understanding of their continuing roles, and of their senior staff, in the procurement, implementation and benefits realisation process.	It must be demonstrated that senior level commitment has been obtained, e.g. by providing the board minutes at which the project was agreed, together with an appropriate note from the Chairman of the Board and the Chief Executive. Where appropriate, the commitment of other senior members of staff should be demonstrated, e.g. heads of clinical directorates.
9	That there is sufficient and adequately skilled IM&T resource to manage successfully the specification, procurement and implementation of the system.	The stucture, numbers and reporting lines of the IM&T department and the extent to which internal IM&T resources will be made available to this project plus details of other IM&T resources that might be used. A short CV of the head of the IM&T department and of the project managers, concentrating on their IM&T skills.
10	That there is a resourced and structured training programme.	A summary of the training needs assessment should be included together with a description of the training programme to meet the needs identified.
11	That there is a clear plan for benefits realisation, including a commitment to assign responsibilities for realising benefits to an individual with sufficient authority and resources to deliver.	The names and reporting lines of the individuals responsible for the achievement of benefits.
12	That there is a commitment to post implementation evaluation, the results of which will be made available to the authority approving the investment.	A clear commitment should be demonstrated to the post implementation evaluation process together with dates for: a) post-evaluation review in accordance with PRINCE; b) the final review; minimum of six months after implementation; c) where the implementation will take more than a year milestones should be identified and an annual report submitted to the normal approval body; d) where the implementation will take less than a year, the date of the scheduled completion.

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